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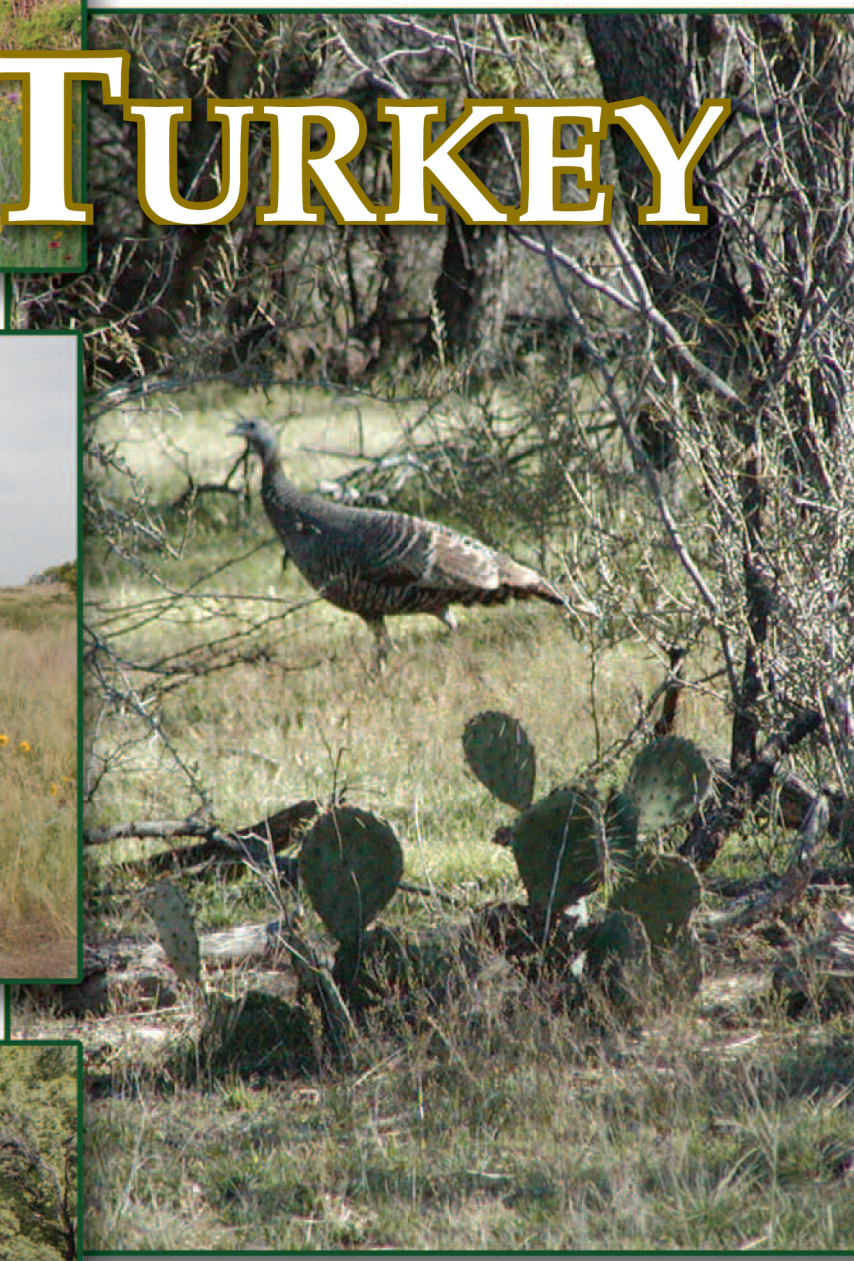
Habitat Appraisal Guide for Rio Grande Wild Turkey



Habitat Appraisal Guide for Rio Grande Wild Turkey

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Acknowledgements

This work stems from a collaborative effort between Texas A&M University–Department of Wildlife and Fisheries Sciences, Texas Cooperative Extension, the Caesar Kleberg Wildlife Research Institute, and the Texas Parks and Wildlife Department. Funding was provided by Texas Parks and Wildlife Department's Small Game and Habitat Assessment Program. We thank the Institute of Renewable Natural Resources at Texas A&M University for their support. Additionally, we appreciate the efforts of Terry Blankenship, Mike Krueger, Ralph Suarez and Ray Aguirre for providing an editorial review of this manuscript. Photos were provided by Matt Butler, Jim Cathey, Lang Alford, Justin Dreibelbis, Shawn Locke and Robert Sanders.

NOTES

Introduction

Wildlife management is an integral part of farm and ranch operations throughout much of Texas. Although there is a long tradition of managing solely for livestock, active management focused on enhancing habitat for wildlife populations is gaining momentum. Interest in habitat management for wild turkeys (*Meleagris gallopavo*) has grown over the last fifteen years as landowners, hunters, and wildlife viewers recognize their actions can impact natural resources. Wild turkey hunting generates millions of dollars annually through direct and indirect economic benefits (Baumann et al. 1990) and therefore represents a valuable resource to landowners.

Five subspecies of wild turkey exist in North America, with three subspecies residing in Texas. Of the three Texas subspecies, the Rio Grande wild turkey (*M. g. intermedia*) is the most abundant and occupies the widest range (Figure 1). Rio Grande wild turkeys inhabit several ecological regions (Figure 2), each with different dominant vegetation communities. Despite the wide range of Rio Grande wild turkeys, their basic habitat requirements (i.e., food, cover and water) show little variation.

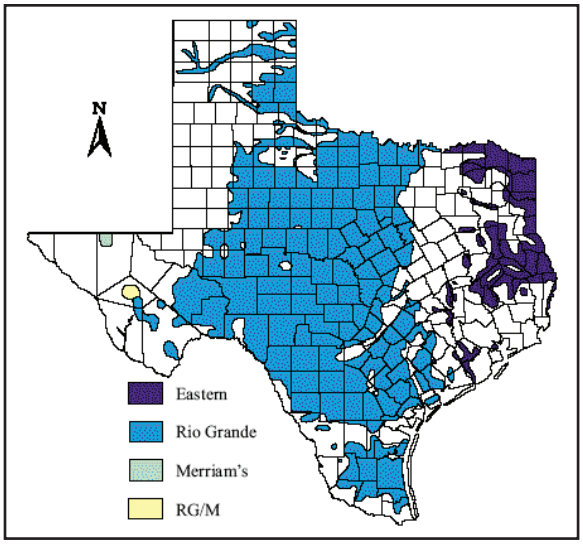

Figure 1. Distribution of the 3 subspecies of wild turkey found in Texas. Distribution is based on Texas Parks and Wildlife Department data.

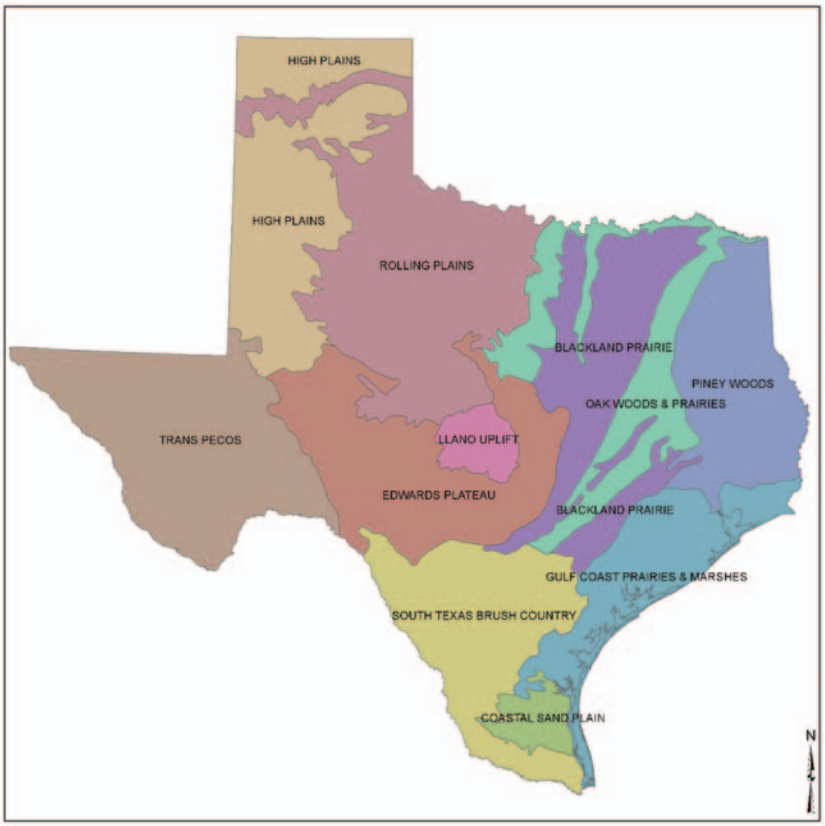

Figure 2. Because of differences in climate, soil types, and communities of plants and animals, 10 natural regions are commonly recognized in Texas: 1) Piney Woods, 2) Gulf Coastal Prairies and Marshes, 3) Oak Woods and Prairies, 4) Blackland Prairie, 5) Coastal Sand Plain, 6) South Texas Brush Country, 7) Edwards Plateau/Llano Uplift, 8) Trans-Pecos, 9) Rolling Plains, and 10) High Plains.

Although the Rio Grande wild turkey is the most numerous subspecies in Texas, information regarding ecology and management lags behind other subspecies (Peterson 1998). Since the 1970s, the Texas Parks and Wildlife Department has documented declines in Rio Grande wild turkey numbers within some areas of its distribution. The causes of these declines are unknown but might be associated with reproductive stages, such as nest success or poult survival (Collier et al. 2007), changes in land use and fragmentation of large land holdings into smaller parcels (Wilkins et al. 2003), or an increase in brush height and density (Wilbanks 2003). Vegetative cover is considered an important factor in reproductive activities because nesting success is known to be influenced by vegetation (Hohensee and Wallace 2001, Huffman et al. 2006), and ground-level vegetative cover can influence preflight poult survival (Spears et al. 2007).

Recently, the Texas Parks and Wildlife Department developed a "Managed Lands Game Bird Program" to provide incentives to landowners for managing wildlife habitat on their property. In order to provide an incentive, an initial evaluation of the habitat needs to be conducted to identify the habitat factors that are limiting the wildlife species being managed. Therefore, a Rio Grande wild turkey habitat appraisal guide provides landowners and managers a standardized, systematic method to evaluate current habitat conditions, identify limiting factors, and potentially improve habitat through appropriate management practices throughout the Rio Grande wild turkey's range in Texas.

Habitat Requirements

Usable Space and Interspersion

Two of the most important factors in Rio Grande wild turkey habitat are usable space and interspersion of habitat types. Usable space (Guthery 1997) refers to the amount of area a population requires to fulfill biological, behavioral, and physiological requirements. Therefore, population size would logically increase as the amount of usable space increases, and as usable space decreases, so should population size. Wild turkeys typically require large areas of usable space to support viable, sustaining populations (Bidwell 2007).

An animal's range is defined as the area it uses while engaged in normal activities of gathering food, breeding, and caring for offspring (Burt 1943). Total range is difficult to determine for the life of most animals due to difficulties following individuals throughout their entire lifespan; thus, often seasonal or annual range sizes are reported. Research conducted in the Rolling Plains and Edwards Plateau ecoregions found Rio Grande wild turkey annual range sizes to vary between 2,400–5,900 acres and 3,800–6,600 acres, respectively (Phillips 2004, Schapp 2005). Similar annual range sizes (4,670 acres) in the eastern subspecies have also been reported (Thogmartin 2001). Seasonal range shifts occur due to changes in resources (e.g., food sources) and habitat requirements (e.g., nesting, brooding). Rio Grande wild turkeys are highly mobile, and annual movements can vary between 6–26 miles (Thomas et al. 1966, Phillips 2004, Schapp 2005). Rio Grande wild turkeys do not migrate, but they do exhibit pronounced seasonal shifts and may have distinct summer and winter ranges.

Based on the above information, Rio Grande wild turkey ranges often exceed the size of a single property being evaluated. Small acreages (e.g., <1,000 acres) may still provide essential components of Rio Grande wild turkey habitat requirements. For example, areas containing roost sites or quality production grounds (i.e., nesting or brooding areas) are vital, and disturbance or alteration of these areas can significantly impact wild turkey populations and numbers across a broader spatial scale. Therefore, small acre-

age landowners may benefit from working cooperatively with neighbors to collectively provide essential components of Rio Grande wild turkey habitat. The Texas Organization of Wildlife Management Associations (http://www.towma.org/) provides education, coordination, and pursuit of issues among landowners interested in creating and running local wildlife management associations. DeMaso et al. (2007) provide strategies for forming a quail management cooperative that could be used for forming wild turkey cooperatives.

Rio Grande wild turkeys require two basic habitat types: wooded areas and open areas. The amount of interspersion (i.e., close mixing of habitat types) of these two types may determine habitat quality and are essential in attracting and maintaining wild turkey populations (Figure 3; NRCS 1999).

Figure 3. Rio Grande wild turkeys require interspersion of wooded and open areas. Notice across this landscape how wooded and open areas are intermixed.

Glennon and Porter (1999) found that townships in southwest New York with greater interspersion of forests and open areas supported larger turkey populations. Furthermore, habitat suitability increased by providing smaller, irregularly shaped patches rather than a few large patches (Glennon and Porter 1999). This effectively increases the amount of heterogeneity (i.e., dissimilar or diverse habitat types). Although the proportion of wooded and open areas may vary between and within ecoregions, habitat will always consist of the same two components. This is particularly important with the proliferation of small land ownerships (<500 ac) in Texas and increasing land fragmentation (Wilkins 2003).

Protective cover

Rio Grande wild turkeys are often found near the edge of differing habitats, such as woodland areas (i.e., riparian, live oak motte, mesquite grove, etc.) and grassland areas. Proximity of multiple habitats provides turkeys with opportunities to quickly escape from predators (Bailey et al. 1967) and with shaded areas for loafing during warm days (Schorger 1966). Woodlands with high canopies and wide crowns provide ideal areas for loafing (Beasom and Wilson 1992).

Roost sites are critical habitat requirements of the Rio Grande wild turkey and are a year-round necessity (Kilpatrick et al. 1988, Chamberlain et al. 2000). The importance of winter roost sites has been well documented (Thomas et al. 1966, Haucke 1975, Swearingin 2007). Rio Grande wild turkeys congregate at communal winter roost sites typically located along a stream or in a valley (Figure 4; Thomas et al. 1966, Cook 1973). Potentially, large numbers of turkeys (≥200) can roost in an area (Butler 2006). Several studies (Haucke 1975, Perlichek 2005, Swearingin 2007) have determined that tree height is the dominant factor in roost site selection, regardless of tree species. Tree height isolates roosting turkeys from ground-dwelling predators and provides a line of sight to detect approaching predators (Swearingin 2007). The number of suitable roosting limbs on a tree may be a function of the diameter at breast height (dbh). Trees with a larger dbh (Figure 4) may have larger, flatter limbs that could support roosting wild turkeys (Crockett 1969).

Because of their wide distribution, Rio Grande wild turkeys use a variety of tree species (Table 1). Size and structure of the roost

(A)

(B)

(C)

Figure 4. Roost sites are a critical habitat component for wild turkeys. (A) Rio Grande wild turkeys prefer large roost trees and will roost together in large flocks during the winter. (B) A biologist measures the diameter at breast height (DBH) of trees to determine the basal area. (C) Openness of the understory may be important in roost site selection by Rio Grande wild turkeys.

site, as well as the understory vegetation, may be important. Roost sites should be a minimum of 10–15 acres, and at least 10–15% of the roost site should be wooded (Swearingin 2007). Basal area within the stand should be between 75 and 120 square feet/acre (Crockett 1969, Scott and Boeker 1975), and stands with more canopy cover (50–70%) are preferred (Swearingin 2007). Some evidence suggests turkeys prefer an open understory beneath roost sites (Figure 4), which may explain accounts of turkeys preferring to roost over water. Short vegetation was typical of areas where turkeys ascended and descended from roost sites in south Texas (Haucke 1975).

Some gobblers will use winter roost sites throughout the year, while others will disperse to other areas. Females begin ground roosting once incubation is initiated and will use roosts close to brood-rearing areas after poults are capable of flying. Additionally, man-made structures (e.g., utility lines and towers, windmills) can serve as roosting sites where few or no trees are present (Haucke 1975); in addition, artificial roosts specifically designed for turkeys may also be provided (Figure 5).

Table 1. Roost tree species commonly used by Rio Grande wild turkeys. Table was adapted from Beasom and Wilson (1992) and used data from Walker (1941), Glazener (1967), Haucke (1975).

Species	Location[a]
American elm	EP, BP
Bald cypress	EP
Black willow	STBC, EP, RP,
Blackjack oak	EP, BP
Cedar elm	STBC, EP, BP
Eastern cottonwood	BP, STBC, EP, RP, HP
Emory oak	TP
Honey mesquite	STBC
Juniper	EP, TP
Live oak	STBC, EP
Netleaf hackberry	STBC, EP
Pecan	EP, RP, BP
Plains cottonwood	HP
Post oak	EP, BP
Sugar hackberry	STBC, EP, BP
Sycamore	STBC, EP, RP, HP, BP
Texas oak	EP
Texas walnut	EP, TP
Western soapberry	STBC, EP, TP, RP, HP

[a] Blackland Prairies (BP), Edwards Plateau (EP), High Plains (HP), South Texas Brush Country (STBC), Trans Pecos (TP).

Destruction or disturbance of winter roost sites can have detrimental effects on Rio Grande wild turkey populations. Destruction can be caused by conversion of wooded areas to increase agricultural production, by urban sprawl, or by inundation of water for reservoir construction. Loss of roosting habitat increases susceptibility to predators and initiates a search for alternative roost sites. Furthermore, because Rio Grande wild turkey often prefer

Figure 5. Artificial roosting structures may be used by Rio Grande wild turkeys where sufficient roost trees do not exist.

slow growing, hardwood trees, restoration of suitable roosting habitat may take decades. The disturbance of existing habitat can be harmful. Disturbances such as increased human encroachment, prolonged ranch activities, or hunting in roost sites can cause wild turkeys to abandon the roost site.

Nesting Cover

Rio Grande wild turkeys nest on the ground within grass clumps, leaf litter, brush piles, or understory vegetation (Cathey et al. 2007). A shallow depression is scratched out of the leaf litter or ground cover for a nest bowl. Although a wide variety of habitat measures have been evaluated, nest sites are believed to be selected for their concealing cover and their proximity to a permanent water source (Beasom and Wilson 1992). Woody plants, herbaceous vegetation, brush piles, vines or agricultural crops ≥18 inches in height provide optimal lateral screening cover (Figure 6; Cook 1972, Ransom et al. 1987,

(A)

(B)

(C)

Figure 6. Rio Grande wild turkeys nest in understory vegetation (A), brush piles (B), and clumps of grass (C). Notice the patchiness of cover (C) which is preferable to Rio Grande wild turkeys.

Huffman et al. 2006). In south Texas, Beasom (1973) found a positive relationship between turkey reproductive success and herbaceous cover. Density and structure of vegetation may moderate nest predation (Schmutz et al. 1989, Hohensee and Wallace 2001).

Patches of nesting cover across a landscape are preferable for wild turkeys (Thogmartin 1999). In the Edwards Plateau, wild turkeys have been known to nest in road right-of-ways (Cook 1972). This is likely a function of right-of-ways being protected from poor grazing management and thereby providing adequate nesting cover.

Rio Grande wild turkey nests are often closely associated with available water. Cook (1972) found 102 of 121 nests in the Edwards Plateau within a quarter of a mile of a water source. Similar results were obtained in south Texas (Ransom et al. 1987), and several Texas researchers have noted the importance of available water.

Brood Habitat

Brood habitat consists of three main elements: (1) insect production areas, (2) vegetation that facilitates foraging, and (3) vegetation that has sufficient cover for poults but provides an unobstructed view for hens (Porter 1992). During the first few weeks of life, wild turkey poults are dependent on protein obtained from invertebrates (Hurst and Poe 1985). Many herbivorous insects, such as grasshoppers, are associated with new, tender vegetative growth (Schwertner and Silvy 2005, Randel et al. 2006). Patchy winter burns can produce a mosaic of insect production grounds while leaving areas for nesting or ground-roosting.

Brood-rearing habitat is often a mix of herbaceous vegetation and forest (Figure 7; Porter 1992). Spears et al. (2007) found ground vegetation positively influenced preflight poult survival. Shrubs 2.0–6.5 feet in height provided important cover for preflight poults

(A)

(B)

(C)

Figure 7. Brood habitat provides sufficient cover for turkey poults while allowing the hen an unobstructed view. Hen with poults take cover (A). Poults conceal themselves in cover (B and C).

(Spears et al. 2007), and areas with shrubs ≥6.5 feet were avoided. As poults begin to fly, tree roosts become more important than ground cover to poult survival. Therefore, the

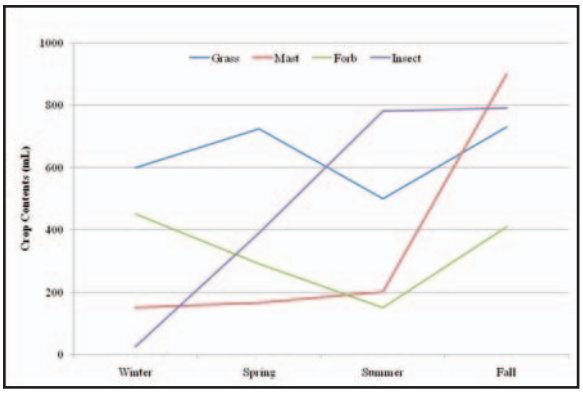

Figure 8. Seasonal use of food items by Rio Grande wild turkeys. Figure was recreated using data from Litton (1977).

Table 2. Important food items use by Rio Grande turkeys in the Rolling Plains and Edwards Plateau ecoregions of Texas.

Agarita	Hackberry	Rescue grass
Bladderpod	Honey mesquite	Sand dropseed
Bristlegrass	Insects	Silverleaf nightshade
Broomweed	Juniper	Skunkbush
Bumelia	Little barley	Squirreltail grass
Catnip noseburn	Littleleaf sumac	Tasajillo
Croton	Lotebush	Texas cup grass
Ephedra	Milk vetch	Tobosa grass
Evening primrose	Panic grass	Walnut
Filaree	Pecan	White tridens
Gaura	Pigeonberry	Wild mercury
Grama grasses	Plantago	Wild onion
Ground-cherry	Prickly pear	

Table 3. Important food items use by Rio Grande turkeys in the South Texas Brush Country.

Beggar-tick	Ground-cherry	Polytaenia
Bristle grass	Groundsel	Prickly pear
Buffel grass	Hackberry	Sida
Condalia	Honey mesquite	Signal grass
Coreopsis	Insects	Smallflower corydalis
Crabgrass	Lantana	Stiffstem flax
Croton	Lime prickly ash	Texas grass
Dropseed	Milk pea	Texas virgin's bower
Euphorb	Oak acorns	Wild tobacco
False dandelion	Palafoxia	Windmill grass
Flat sedge	Panic grass	Yellow wood sorrel
Granjeno	Paspalum	
Grape	Pinnate tansy mustard	

mixture of woodland and herbaceous vegetation within close proximity to each other is critical for brood-rearing habitat (see above discussion on usable space). A significant amount of overlap among roosting, nesting, and brood habitat may occur; therefore, quantifying the proportions required of each component may be difficult. A mosaic of habitat patchiness across a landscape is desirable.

Food Habits

The Rio Grande wild turkey's annual diet based on percent volume consists of grasses (36%), invertebrates (29%), mast (19%), and forbs (16%; Litton 1977). Rio Grande wild turkeys are opportunistic foragers, and use of food items is based primarily on their seasonal availability (Figure 8). Because Rio Grande wild turkeys have an extensive range within Texas, the number of plant species they forage on is diverse (Tables 2 and 3). Wild turkeys feed on a variety of mast (e.g., pecans, acorns, mesquite beans), fruits and tubers (e.g., grapes, berries, wild onion), green foliage (e.g., grass and forbs), and seeds (e.g., grama, dropseed), dependent upon seasonal availability.

Invertebrates have long been noted as a valuable protein resource for turkey poults and comprise the majority of their post-hatch diet during the first several weeks (Hurst 1992). Randel (2003) found that brood survival and insect abundance were greater on areas with stable numbers of Rio Grande wild turkeys than on areas with declining Rio Grande wild turkey numbers. Insect consumption by wild turkeys occurs year-round by all age groups, with peaks during the spring and summer when insect abundance is highest. Before and during nesting, reproductively active hens increase their insect and snail consumption for additional protein and calcium sources (Pattee and Beasom 1981).

Supplemental feeding of Rio Grande wild turkeys can take a wide variety of forms (Figure 9). However, it is important to recognize that supplemental feeding is not and should not substitute for habitat management practices, regardless of property size. Speculation occurs as to whether Rio Grande wild turkeys are food-limited, particularly in Texas, where

(A)

(B)

Figure 9. Supplemental feeding can occur from food plots (A) or feeders (B).

long growing seasons combined with moderate winters and active supplemental feeding for deer is conducted. Alternatively, supplemental feeding has been thought to increase reproductive success (Pattee and Beasom 1979). Nevertheless, feeders that concentrate turkeys increase the opportunity of disease and parasite transmission and make them more vulnerable to predation (Guthery 2004). Mycotoxins (e.g., Aflatoxins) present in feed and feeders can be detrimental to both target and non-target animals (Thompson and Henke 2000, N. Wilkins, Texas Cooperative Extension, USA, unpublished data).

Predation and disease transmission are prevalent concerns with food plots (Hurst 1992). Food plots designed for turkeys or other species can be valuable during certain times of the year. However, food plots should be of sufficient size (≥2–3 acres) to reduce accumulation of feces and related parasites and diseases (Stoddard 1963). Both feeder and food plot locations should be moved frequently to reduce dependence and opportunity of disease transmission.

Water Requirements

The importance of surface water (Figure 10)

(A)

(B)

Figure 10. Surface water is important for Rio Grande wild turkeys and may come in the form of rivers (A), stock tanks (B), guzzlers, windmills, springs or seeps.

to Rio Grande wild turkeys has already been stated and many suggest that turkeys require water on a daily basis (Bidwell 2007). The distribution of Rio Grande wild turkeys, in many historical accounts, was associated with streams and river bottoms (Glazener 1967). Water development as a result of livestock production had a dramatic effect on Rio Grande wild turkey distribution (Ramsey 1958). Stock tanks and other water developments expanded the effective range of Rio Grande wild turkeys, no longer restricting them to the streams and bottomlands and allowing them to exploit additional resources (Glazener 1967). Lack of suitable surface water can negatively affect breeding, particularly during periods of drought (Sanders 1939).

The Texas Parks and Wildlife Department recommends providing a permanent water source every square mile where none currently exist. Water sources can be in the form of ponds, guzzlers, windmills, springs or seeps. Harvesting rainwater (Cathey et al. 2006) can be an efficient method for providing water in remote areas. It also may be necessary to exclude livestock from some of the watering areas to prevent destruction and contamination.

Water in the form of precipitation is directly and indirectly important to Rio Grande wild turkeys. Precipitation directly affects ponds, catchments, and other water sources, making surface water available to wild turkeys. The timing and amount of precipitation can have a significant impact on vegetative cover, nesting success, survival and poult production (Hohensee and Wallace 2001, Schwertner et al. 2005). Spring rainfall provides moisture required for vegetation growth and cover that affects nesting success. For example, Schwertner et al. (2005) found a positive relationship between Rio Grande wild turkey poult production and precipitation in Texas.

Habitat Management Tools

Livestock Grazing

Livestock production and management of Rio Grande wild turkeys can be compatible, given moderate to low stocking rates and grazing intensity. Concerns often associated with the interaction of livestock and wild turkeys include: nest trampling, alteration of nesting areas resulting in reduced nesting cover or increasing nest predation, reduction in food availability, and altering wild turkey movement patterns (Beasom and Wilson 1992). Koerth et al. (1983) and Bareiss et al. (1986) both found nest trampling by livestock was low under continuous and short duration grazing systems and suggested that trampling losses may only be a concern at high stocking rates (≥1 ac/animal unit). Rio Grande wild turkey nest survival was higher under rotational grazing systems in comparison to continuous grazing (Baker 1979), and Merrill (1975) found no nests or broods located in heavily grazed areas, with the majority of nests found in complete rest areas or light, continuous grazing pastures. Similarly, Ransom et al. (1987) found all nesting sites located in deferred grazing areas. Heavy grazing intensity can potentially reduce food availability and in turn require wild turkeys to increase movements and ranges to fulfill daily requirements. If turkeys are a management goal, grazing management may need to be adjusted to meet turkey habitat requirements, especially for nesting and poult-rearing habitat.

Prescribed Fire

Prescribed fire is a valuable tool for managing Rio Grande wild turkey habitat (Figure 11; Schwertner and Silvy 2005). Timing of burns is important to reduce impacts to poults and nests. Summer and winter fires are valuable tools to manage encroaching brushes, particularly cedar, juniper, and south Texas brush species. Fall and winter burns can

(A)

(B)

Figure 11. Prescribed fire is a valuable tool for managing Rio Grande wild turkey habitat. Photo A shows a prescribed fire conducted in the Edwards Plateau and photo B shows the same burn site a few months later.

(A)

(B)

Figure 12. Moderate brush control conducted in small, patchy patterns can stimulate forb and forage production while leaving unmanipulated areas meeting other turkey habitat requirements.

stimulate forb production, green forage, and invertebrate communities. Additionally, fires can remove understory brush within roosting areas and create openings for brood-rearing habitat. Patchy burns of different degrees of intensity and frequency can create the mosaic of habitat requirements previously mentioned. Before using fire, be sure to obtain assistance from knowledgeable personnel (Texas Parks and Wildlife Department, Texas Cooperative Extension).

Brush Control

Brush control has been a highly used management tool in Texas, primarily for increasing forage production concerning livestock (Figure 12; Quinton et al. 1980). Undoubtedly, brush control can influence Rio Grande wild turkey habitat. Large, cleared areas do not provide quality habitat, nor do dense, brushy areas (Lyons and Ginnett 2007). Quinton et al. (1980) found that brush control can benefit cattle operations and maintain turkey populations, provided roost trees and mast trees are not disturbed. Moderate brush control conducted in small, patchy patterns can stimulate forb and forage production while leaving areas meeting other turkey habitat requirements unmanipulated.

Appraising Turkey Habitat

The habitat appraisal process aids landowners, land managers, and biologists in evaluating the current condition of Rio Grande wild turkey habitat. It can help identify limiting factors such as lack of available surface water that may negatively impact wild turkey populations and prohibit populations from reaching their potential. Once limiting factors are identified, management suggestions can be incorporated into a management plan to enhance overall habitat suitability and effectively address limiting factors.

Prior to beginning the habitat appraisal (Appendix A and B), it would be advantageous to acquire an aerial photograph of the property. This will help to evaluate spatial aspects of the appraisal, such as the interspersion of habitat components or the size and patchiness of nesting areas. Interspersion could potentially be evaluated by drawing straight lines across the photo and counting the number of times the vegetation changes (Figure 13). A lower number of changes in habitat types indicates a lack of interspersion, whereas several changes indicates good interspersion. A field evaluation of habitat characteristics is necessary. Tree heights, percent canopy cover, and number of food items may require field inspection by a wildlife biologist or measurement to determine if appropriate conditions exist. This habitat appraisal does not take into account rainfall, which is a very important factor for Rio Grande wild turkeys and habitat. Therefore, it may be necessary to envision areas as they might look under various weather conditions (e.g., drought) when the habitat appraisal is being conducted.

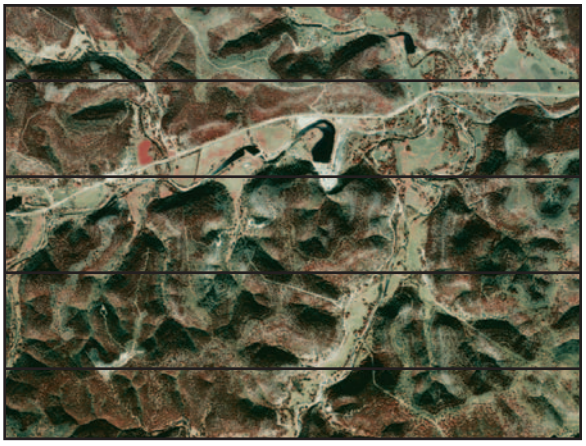

Figure 13. An aerial photograph can be useful in evaluating spatial aspects of Rio Grande wild turkey habitat. Interspersion could potentially be evaluated by drawing straight lines across the photo and counting the number of times the vegetation changes.

How to Use the Habitat Appraisal Key

The dichotomous key (Appendix A) is made up of eight major sections (A–H) and 27 sets of statements. Begin with section A, question one, and read both statements (a and b) completely. Determine which statement best describes the condition associated with the property being evaluated. Based on your response, the right-hand column of the key (Go to) leads you either to the next set of statements based on the number provided or leads you to the management action table based on the roman numeral. For example, the first set of statements inquires about the size of the property. If the property is ≥1,000 acres then you would proceed to statement 2. However, if your property is <1,000 acres, then you are advised to consult management action I (Appendix B). The management suggestions are designed to determine a potential limiting factor and provide advice for enhancing Rio Grande wild turkey habitat. Once you have read the management action, the column titled "return to" provides the next set of statements in the dichotomous key that should be read. This will allow you to complete the habitat appraisal and determine areas where conditions are adequate (statements in bold), as well as determine any additional limiting factors. Once all limiting factors are identified, they can be addressed through management actions suggested in a management plan. For

assistance in developing a wildlife management plan for your property, contact The Texas Parks and Wildlife Department or Texas Cooperative Extension.

Limiting Factors

Undoubtedly, many properties will have limiting factors. Although each factor should be addressed, which categories should take priority? The dichotomous key was built in a hierarchical manner beginning with the most important factor (i.e., habitat size and interspersion). However, our order of importance can be debatable, particularly in certain circumstances. For example, nesting or brood-rearing habitat may take precedence over roosting habitat in some of the ecological regions (i.e., Edwards Plateau) where roost sites are abundantly available. This guide is meant to serve as a source for identifying potential limiting factors for Rio Grande wild turkeys across their range in Texas and can assist landowners and managers in addressing factors that may limit Rio Grande wild turkey potential. The following pages (Appendix A & B) provide land managers with a habitat appraisal key and associated management suggestions table for evaluating Rio Grande wild turkey habitat in Texas.

Literature Cited

Badyaev, A. V., and J. D. Faust. 1996. Nest site fidelity in female wild turkey: Potential causes and reproductive consequences. The Condor 98:589–594.

Bailey, R. W. 1967. Behavior. Pages 93–111 in O. H. Hewitt, editor. The wild turkey and its management. The Wildlife Society, Washington, D. C., USA.

Baker, B. W. 1978. Ecological factors affecting wild turkey nest predation on south Texas range lands. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 32:126–136.

Bareiss, L. J., P. Schulz, and F. S. Guthery. 1986. Effects of short-duration and continuous grazing on bobwhite and wild turkey nesting. Journal of Range Management 39:259–260.

Baumann, D. P., Jr., L. D. Vanglider, C. I. Taylor, R. Engle-Wilson, R. O. Kimmel, and G. A. Wunz. 1990. Expenditures for wild turkey hunting. Proceedings of the National Wild Turkey Symposium 6:157–166.

Baxter, W. L., and C. W. Wolfe. 1972. The interspersion index as a technique for evaluation of bobwhite quail habitat. Proceedings of the National Bobwhite Quail Symposium 1:158–165.

Beasom, S. L. 1973. Ecological factors affecting wild turkey reproductive success in south Texas. Dissertation, Texas A&M University, College Station, Texas, USA.

Beasom. S. L., and D. Wilson. 1992. Rio Grande turkey. Pages 306–330 in J. G. Dickson, editor. The wild turkey: biology and management. Stackpole Books, Harrisburg, Pennsylvania, USA.

Bidwell, T. G. 2007. Management of the wild turkey in Oklahoma. Available from http://www.okrangelandswest.okstate.edu/pdfFiles/OSUextPubs/F-8700.pdf. Accessed July 16, 2007.

Burt, W. H. 1943. Territoriality and home range concepts as applied to mammals. Journal of Mammology 24:346–352.

Butler, M. J. 2006. Evaluation of survey techniques for Rio Grande wild turkey populations in the southern Great Plains. Dissertation, Texas Tech University, Lubbock, USA.

Cathey, J. C., R. A. Persyn, D. O. Porter, and M. C. Dozier. 2006. Harvesting rainwater for wild life. Texas A&M University System, Texas Cooperative Extension Publication B-6182 Pp. 1 16.

Cathey, J. C., K. Melton, J. Dreibelbis, B. Cavney, S. J. Demaso, T. W. Schwertner, and B. Collier. 2007. Rio Grande wild turkey in Texas: their biology and management (In press).

Chamberlain, M. J., B. D. Leopold, and L. W. Burger. 2000. Characteristics of roost sites of adult wild turkey females. Journal of Wildlife Management 64:1025–1032.

Collier, B. A., D. A. Jones, J. N. Schaap, C. J. Randel, III, B. J. Willsey, R. Aguirre, T. W. Schwertner, Nova J. Silvy, and M. J. Peterson. 2007. Survival of Rio Grande wild turkeys on the Edwards Plateau of Texas. Journal of Wildlife Management 71:82–86.

Cook, R. L. 1972. A study of nesting turkeys in the Edwards Plateau of Texas. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 26:236–244.

Cook, R. L. 1973. A census technique for the Rio Grande turkey. Pages 279–283 in G. C. Sanderson and H. C. Schultz, editors. Wild turkey management: current problems and programs. Missouri Chapter of The Wildlife Society and University of Missouri Press, Columbia, Missouri, USA.

DeMaso, S. J., W. P. Kuvlesky, Jr., and J. B. Hardin. 2007. Strategies for forming a quail management cooperative. Pages 363–371 in L. A. Brennan, editor. Ecology and management of Texas quails. Texas A&M University Press, College Station, Texas, USA.

Glazener, W. C. 1967. Management of the Rio Grande turkey. Pages 453–492 in O. H. Hewitt, editor. The wild turkey and its management. The Wildlife Society, Washington, D. C., USA.
Glennon, M. J., and W. F. Porter. 1999. Using satellite imagery to assess landscape-scale habitat for wild turkeys. Wildlife Society Bulletin 27:646–653.
Guthery, F. S. 1997. A philosophy of habitat management for Northern bobwhites. Journal of Wildlife Management 61:291–301.
Guthery, F. S., T. L. Hiller, W. H. Puckett, Jr., R. A. Baker, S. G. Smith, and A. R. Rybak. 2004. Effects of feeders on dispersion and mortality of bobwhites. Wildlife Society Bulletin 32:1248–1254.
Haucke, H. H. 1975. Winter roost characteristics of the Rio Grande turkey in south Texas. Proceedings of the National Wild Turkey Symposium 3:164–169.
Hohensee, S. D., and M. C. Wallace. 2001. Nesting and survival of Rio Grande turkeys in northcentral Texas. Proceedings of the National Wild Turkey Symposium 8:85–91.
Huffman, R. T., M. C. Wallace, W. B. Ballard, G. Hall, R. Houchin, R. Applegate, S. DeMaso, and P. S. Gipson. 2006. Nesting habitat of Rio Grande wild turkeys. Managing Wildlife in the Southwest 2006:103–111.
Hurst, G. A. 1992. Foods and Feeding. Pages 66–83 in J. G. Dickson, editor. The wild turkey: biology and management. Stackpole Books, Harrisburg, Pennsylvania, USA.
Hurst, G. A., and W. E. Poe. 1985. Amino acid levels and patterns in wild turkey poults and their food items in Mississippi. Proceedings of the National Wild Turkey Symposium 5:133–143.
Kilpatrick, H. J., T. P. Husband, and C. A. Pringle. 1988. Winter roost site characteristics of eastern wild turkeys. Journal of Wildlife Management 52:461–463.
Koerth, B H., W. M. Webb, F. C. Bryant, and F. S. Guthrey. 1983. Cattle trampling of simulated ground nests under short duration and continuous grazing. Journal of Range Management 36:385–386.
Litton, G. W. 1977. Food habits of the Rio Grande turkey in the Permian Basin of Texas. Austin: Texas Parks and Wildlife Department Technical Series No. 18.
Lyons, R. K., and T. F. Ginnett. Year. Integrating deer, quail and turkey habitat. Texas Agricultural Extension Service, Texas A&M University, College Station, Texas, USA.
Merrrill, L. B. 1975. Effects of grazing management practices on wild turkey habitat. Proceedings of the National Wild Turkey Symposium 3:108–112.
Natural Resource Conservation Service (NRCS). 1999. Wild turkey (*Meleagris gallopavo*). Fish and Wildlife Habitat Management Leaflet, Madison, Mississippi, USA.
Pattee, O. H., and S. L. Beasom. 1981. A partial nutritional analysis of wild turkey hen diets in springtime. Proceedings of the Annual Conference, Southeastern Association of Fish and Wildlife Agencies 35:225–232.
Perlichek, K. B. 2005. Distribution, delineation, and characteristics of roosting habitat of wild turkey in Trans-Pecos, Texas. Thesis, Sul Ross State University, Alpine, Texas, USA.
Peterson, M. J. 1998. Book review: proceedings of the seventh National Wild Turkey Symposium. Journal of Wildlife Management 62:816–818.
Phillips, R. S. 2004. Movements, survival, and reproduction of Rio Grande wild turkeys in the Texas Panhandle. Thesis, Texas Tech University, Lubbock, USA.
Porter, W. F. 1992. Habitat requirements. Pages 202–213 in J. G. Dickson, editor. The wild turkey: biology and management. Stackpole Books, Harrisburg, Pennsylvania, USA.

Quinton, D. A., A. K. Montei, and J. T. Flinders. 1980. Brush control and Rio Grande turkeys in north-central Texas. Journal of Range Management 33:95–99.
Ramsey, R. R. 1958. Turkeys for tomorrow. Texas Game and Fish 16:16–17, 28.
Randel, C. J., III. 2003. Influences of vegetation characteristics and invertebrate abundance on Rio Grande wild turkey populations, Edwards Plateau, Texas. Thesis, Texas A&M University, College Station, Texas, USA.
Randel, C. J., R. B. Aguirre, M. J. Peterson, and N. J. Silvy. 2006. Comparison of two techniques for assessing invertebrate availability for wild turkeys in Texas. Wildlife Society Bulletin 34:853–855.
Ransom, D., Jr., O. J. Rongstad, and D. H. Rusch. 1987. Nesting ecology of Rio Grande turkeys. Journal of Wildlife Management 51:435–439.
Sanders, E. 1939. Wildlife survey, region #8. Texas Game, Fish, and Oyster Commission. Austin, Texas, USA.
Schapp, J. N. 2005. Ranges, movements and spatial distribution of radio-tagged Rio Grande wild turkeys in the Edwards Plateau of Texas. Thesis, Texas A&M University, College Station, Texas, USA.
Schmutz, J. A., C. E. Braun, and W. F. Andelt. 1989. Nest habitat use of Rio Grande wild turkeys. Wilson Bulletin 101:591–598.
Schorger, A. W. 1966. The wild turkey: its history and domestication. University of Oklahoma Press, Norman, Oklahoma, USA.
Schwertner, T. W., and N. J. Silvy. 2005. Prescribed burning for wild turkey management in Texas. Pages 152–160 in C. G. Brown and D. Rollins, editors. Fire as a tool for managing wildlife habitat in Texas. Texas Cooperative Extension, Texas A&M System, San Angelo, Texas, USA.
Scott, V. E., and E. L. Boeker. 1975. Ecology of Merriam's wild turkey on the Fort Apache Indian Reservation. Proceedings of the National Wild Turkey Symposium 3:141–158.
Spears, B. L., M. C. Wallace, W. B. Ballard, R. S. Phillips, D. P. Holdstock, J. H. Brunjes, R. Applegate, M. S. Miller, and P. S. Gipson. 2007. Habitat use and survival of preflight wild turkeys. Journal of Wildlife Management 71:69–81.
Swearingin, R. M. 2007. Winter roosting ecology of Rio Grande wild turkeys in the Rolling Plains of Texas. Thesis, Texas Tech University, Lubbock, Texas, USA.
Thomas, J. W., and H. Green. 1957. Something to gobble about. Texas Game and Fish 15:9–11, 24.
Thomas, J. W., C. V. Hoozer, and R. G. Marburger. 1966. Wintering concentrations and seasonal shifts in range in the Rio Grande turkey. Journal of Wildlife Management 30:34–49.
Thompson, C., and S. E. Henke. 2000. Effect of climate and type of storage container on aflatoxin production in corn and its associated risks to wildlife species. Journal of Wildlife Diseases 36:172–179.
Walker, E. A. 1941. The wild turkey and its management in the Edwards Plateau. Pages 21–22 in Texas Game, Fish and Oyster Commission Quarterly Progress, October–December.
Wilkins, N, A. Hays, D. Kubenka, D. Steinbach, W. Grant, E. Gonzalez, M. Kjelland, and J. Shackelford. 2003. Texas Rural Lands: Trends and Conservation Implications for the 21st Century. Publication number B-6134. Texas Cooperative Extension, Texas A&M University System, College Station, Texas. USA.

Glossary of Terms

Browse – shrubby, woody, or many-branched plants bearing mast, fruit, or tunas.
Cover – any physical or biological features or arrangements of features that provide shelter from weather or concealment from or for predators.
Diameter at breast height – tree diameter, outside bark, at a point 4.5 feet above the ground as measured from the uphill side of the tree.
Ecology – the scientific study of the distribution and abundance of organisms and the interactions that determine distribution and abundance.
Forb – herbaceous and semi-herbaceous plants, both perennial and annual that are often classified as weeds.
Gobbler – a mature adult male turkey.
Grasses – any of a large family (Gramineae) of monocotyledonous mostly herbaceous plants with jointed stems, slender sheathing leaves, and flowers borne in spikelets of bracts.
Ground roost – ground location of hen and poults prior to poults' ability to fly up to roost trees.
Guzzler – a rainwater catchment system designed to store and dispense water to wildlife.
Hen – a female bird.
Herbaceous cover – collection of forbs and grasses that provide shelter and concealment from the weather or from predators.
Interspersion – to place habitat types in or among each other, or intermixing of units of different habitat types.
Mosaic – an area where a range of contiguous habitats occur in transition with one another.
Population – a group of individuals of one species under investigation.
Poult – a young turkey <16 weeks of age, of either sex.
Range – the area an individual uses through time to fulfill its requirements of gathering food, breeding, and caring for offspring.
Roost – a support or perch on which birds rest for the night.
Tom – a male turkey.
Usable space – the amount of area a population has to fulfill their biological, behavioral, and physiological requirements.

Appendix A. Dichotomous key for Rio Grande wild turkey habitat appraisal

A. Habitat Size and Interspersion			Go to
1	a	Area of turkey management is ≥1,000 acres	2
	b	Area of turkey management is <1,000 acres — **Consider management suggestions**	I
2	a	Area of turkey management contains a well interspersed mosaic of wooded and open areas — **Adequate size and interspersion of habitat**	3
	b	Area of turkey management lacks a well interspersed mosaic of wooded and open areas **— Consider management suggestions**	II
B. Roosting Cover			
3	a	Wooded areas make up at least 10–15% of the land area	4
	b	Wooded areas are <10% of the land area — **Consider management suggestions**	III
4	a	Potential roosting location are at least 10–15 acres in stand size	5
	b	Potential roosting location are <10 acres in stand size — **Consider management suggestions**	III
5	a	Basal area of roosting location is between 75–120 ft^2/acre.	6
	b	Basal area of roosting location is not between 75–120 ft^2/acre — **Consider management suggestions**	IV
6	a	Canopy cover ranges between 50–70%	7
	b	Canopy cover is not between 50–70% — **Consider management suggestions**	IV
7	a	Roost sites contain preferred tree species (Table 1)	8
	b	Roost sites do not contain preferred tree species — **Consider management suggestions**	IV
8	a	Mean roost tree height is ≥40 feet	9
	b	Mean roost tree height is <35 feet — **Consider management suggestions**	IV
9	a	Mean roost tree diameter at breast height is ≥17 inches	10
	b	Mean roost tree diameter at breast height is <17 inches — **Consider management suggestions**	IV
10	a	Woody understory (≤6 ft) within roosting area is low to moderate — **Roosting cover is within the optimal range for Rio Grande wild turkeys**	11
	b	Woody understory (≤6 ft) within roosting area is high — **Consider management suggestions**	V
C. Nesting Habitat			
11	a	Hens have been observed nesting on the property or hens with poults have been observed on the property	12
	b	Hens have not been observed nesting on the property — **Consider management suggestions**	VI
12	a	Nesting habitat provides a mix of wooded, shrubby, and herbaceous cover	13
	b	Nesting habitat lacks a mix of wooded, shrubby, and herbaceous cover — **Consider management suggestions**	VI

Appendix A. Cont.

13	a	Area provides one 10 acre patch of nesting habitat for every 100 acres of property	14
	b	Area provides less than one 10 acre patch of nesting habitat for every 100 acres of property — **Consider management suggestions**	VI
14	a	Lateral cover within patches provides 1–2 feet of visual obstruction — **Area provides adequate nesting cover**	15
	b	Lateral cover within patches provides <0.5 feet of visual obstruction — **Consider management suggestions**	VI
D. Brooding Habitat			
15	a	Hens with broods have been observed on the property	16
	b	Hens with broods have not been observed on the property — **Consider management suggestions**	VII
16	a	Grassy areas are found within proximity of wooded areas (<0.5 mile)	17
	b	Grassy and wooded areas are separated by >0.5 mile — **Consider management suggestions**	VII
17	a	Grass is approximately 1–2 feet in height	18
	b	Grass is <1 feet in height — **Consider management suggestions**	VII
18	a	Wooded areas contain shrub understory approximately 2–4 feet in height — **Area provides adequate brood rearing habitat**	19
	b	Wooded areas do not contain shrub understory or it is less than or greater than 2–4 feet in height — **Consider management suggestions**	VII
E. Foods			
19	a	A diverse array (~10–15) of region specific food items (Tables 2 & 3) are available seasonally — **Adequate food items are present**	20
	b	Few (≤8) of the region specific food items are available seasonally — **Consider management suggestions**	VIII
F. Supplemental Feeding			
20	a	Supplemental feeding in the form of feeders for turkeys or other species does not occur on the area	21
	b	Supplemental feeding in the form of feeders for turkeys or other species does occur on the area — **Consider management suggestions**	IX
21	a	Supplemental feeding in the form of food plots for turkeys or other species does not occur on the area	24
	b	Supplemental feeding in the form of food plots for turkey or other species does occur on the area — **Consider management suggestions**	X
22	a	Food plots are large in size (≥2–3 acres)	23
	b	Food plots are small in size (<2 acres) — **Consider management suggestions**	X
23	a	Food plots are planted seasonally for the duration of the year **— Adequate supplemental feeding is present**	24
	b	Food plots are only available for a portion of the year — **Consider management suggestions**	X

Appendix A. Cont.

G. Water			
24	a	Permanent water sources are available approximately 1 per square mile — **Adequate surface water is available**	25
	b	Permanent water sources do not occur within a square mile. — **Consider management suggestions**	XI
H. Grazing			
25	a	Grazing of livestock does occur on the area	26
	b	Grazing of livestock does not occur on the area — **Consider management suggestions**	XII
26	a	Grazing plan allows for deferment of some areas	27
	b	Grazing is continuous — **Consider management suggestions**	XII
27	a	Grazing in nesting areas is moderate to low from April to August — **Grazing plan is compatible with Rio Grande wild turkey management**	—
	b	Grazing in nesting areas is continuous — **Consider management suggestions**	XII

Appendix B. Management suggestions associated with the dichotomous key for appraising Rio Grande wilde turkey habitat.

Roman Numeral	Management Suggestions	Return to
I	Areas <1,000 acres are typically too small to manage for the entirety of a Rio Grande wild turkey population. Forming coops with neighboring landowners may provide adequate usable space. Otherwise, there are many management activities that will attract wild turkeys to the property at various times of the year. Managing for either winter roosting, nesting, or brood-rearing habitat can attract turkeys. Additionally, providing year-round food sources (e.g., native browse and vegetation or food plots) may attract turkeys.	**2**
II	Without an interspersion of essential habitat requirements, wild turkeys may not use the area year-round. If the area contains all the requirements except available surface water, for example, turkeys may be limited in their ability to use other habitat components. Also, if habitat requirements are not within proximity of each other, that may limit the wild turkey's ability to use available resources.	**3**
III	Available roost sites are critical and wooded areas should make up at least 10–15% of the land area, with a minimum stand area being 10–15 acres. In the absence of roost trees, wild turkeys will use artificial roosts (see Haucke 1975), but managing for preferred hardwood trees (Table 1) near available water sources or in riparian corridors should be one long-term goal.	**4, 5**
IV	Basal area within roosting areas should be maintained between 75–120 ft^2/acre. Preferred tree species ≥40 feet in height should be available. Large diameter trees (dbh ≥17 inches) provide good canopy cover (50–70%) and horizontal roosting branches.	**6, 7, 8, 9, 10**
V	Rio Grande wild turkeys typically prefer an open understory beneath roosting trees. This can be achieved through brush control and/or prescribed burning, depending on understory density (Cathey et al. 2007). Management activities should take place when roosts are inactive.	**11**
VI	Preferred Rio Grande wild turkey nesting habitat consists of several patches of vegetative cover. A mix of woody, shrubby and herbaceous vegetation approximately 1–2 feet high provides adequate lateral cover and protection for a nest. Small, patchy prescribed burns of varying intensity and frequency can achieve this habitat goal. Some locations may require deferment from livestock grazing to establish grasses, woody and herbaceous cover of suitable height.	**12, 13, 14, 15**

VII	Brood areas should consist of open, grassy areas within proximity to woody cover. Herbaceous cover 1–2 feet in height and woody cover approximately 2–4 feet in height provide good cover for poults. Small, patchy prescribed burns of varying intensity and frequency can achieve this habitat goal. Some locations may require deferment from livestock grazing to establish grasses and forbs of suitable height.	**16, 17, 18, 19**
VIII	A diverse array of preferred food items (Table 2 and 3) should be available seasonally to Rio Grande wild turkeys. Prescribed burns can stimulate native vegetation, and the conversion of tame grasses to native grasses can be beneficial. Shallow disking (breaking soil 2–4 inches deep) in early spring will stimulate herbaceous plant growth.	**20**
IX	Feeders may be detrimental to Rio Grande wild turkeys by concentrating numbers and may aid in the transmission of diseases and parasites. Predators also may focus on feeder areas as ambush sites. If feeders are used for turkeys or other species, their location should be moved frequently. If this practice is to be implemented, feeders should be placed one per square mile.	**21**
X	Food plots (chufa, clovers, legumes, agricultural crops with small grains or seeds) can be beneficial for Rio Grande wild turkeys during periods of stress (e.g, winter). However, food plots should be relatively large (≥2–3 acres) and available year-round.	**22, 23, 24**
XI	Water is critical for Rio Grande wild turkey habitat. Permanent surface water (e.g., ponds, guzzlers, windmills) should be provided every square mile. Seeps or springs should be fenced from livestock to prevent trampling.	**25**
XII	Grazing of livestock under moderate stocking rates and duration can benefit range conditions. Grazing should be restricted from nesting areas between April and August.	**26, 27**

NOTES

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Issued in furtherance of Cooperative Extension Work in Agriculture and Home Economics, Acts of Congress of May 8, 1914, as amended, and June 30, 1914, in cooperation with the United States Department of Agriculture. Edward G. Smith, Director, Texas AgriLife Extension Service, Texas A&M System.